Emissions Reductions

Paragraphs (d)(1) and (d)(8)

5,123	HHs constructed w/traditional fireplaces (from page 1)
0.28	avg cords per HH (ARB, 1997)
1,400	avg kgs per cord (Houck, 2006)
392	avg kgs of wood burned per HH
512	10% of HHs installing EPA Phase II-certified (estimate)
4,355	85% of HHs installing dedicated NG unit (estimate)
256	5% of HHs installing electric unit (estimate)
6.29	reductions (grams/kg) from installing EPA Phase II-certified
12	reductions (grams/kg) from installing natural gas appliance
13	reductions (grams/kg) from installing electric unit
1,263	kgs reduced from HHs with EPA Phase II-certified
20,484	kgs reduced from HHs with NG unit
1,305	kgs reduced from HHs with electric unit
23,052	Annual kgs of PM reduction
25.36	Annual tons PM reduced from standards for new construction
0.73	Discount factor for wood burning fireplaces not used
18.5	Adjusted annual tons PM reduced from new construction
45	Annual tons of PM reduction from wood burning prohibitions
63.5	Total tons PM reduction per year

Cost-Effectiveness

Paragraphs (d)(1) and (d)(8)

5,123	HHs constructed w/traditional fireplaces
2,500	incremental cost to install EPA Phase II-certified unit (SMAQMD, 2006)
500	incremental cost to install dedicated NG unit (SMAQMD, 2006)
400	incremental cost to install electric unit (SMAQMD, 2006)
1,280,750	capital costs for US EPA Phase II-certified wood burning device
2,177,275	capital costs for natural gas
102,460	capital cost for electric unit
3,560,485	Total capital costs
0	O&M costs presumed to be equivalent to existing non-compliant technology
12.50	present value factor (5% interest rate)
63.5	annual emission reductions

$$\frac{K + (O\&M \times [PVF])}{\text{Emission Reductions} \times 20 \text{ years}} = \frac{3{,}560{,}485 + 0}{1270}$$

$$= \frac{3{,}560{,}485 \text{ \$ annual costs}}{1270 \text{ 20 years of ER}}$$

Cost effectiveness = 2,803 $ per ton PM reduced

Emissions Reductions

Paragraphs (d)(6) and (d)(8)

250	commercial traditional fireplaces (estimate)
1,400	avg kgs of wood burned per commercial fireplace[1]
2,940	high-range kgs of wood burned per commercial fireplace[2]
125	50% replaced with EPA Phase II-certified units
125	50% replaced with dedicated NG units
6.29	reductions (grams/kg) from installing EPA Phase II-certified
12	reductions (grams/kg) from installing dedicated NG unit
1,101	reductions (kgs) from replacement with EPA Phase II-certified
2,100	reductions (kgs) from replacement with dedicated NG units
3,201	Total kgs of PM reduction
3.5	Total tons of PM reduction (2007-2009)
1.2	Annual tons of PM reduction for avg wood usage
2.5	Annual tons of PM reduction for high-range wood usage
0.4	Annual tons of PM reduction from burning prohibitions
1.6	Total tons PM reduction per year for avg wood usage
2.9	Total tons PM reduction per year for high-range wood usage

Notes:

[1] (3.5 kgs/hr * 5 hrs/day * 80 days/season)

[2] (3.5 kgs/hr * 7 hrs/day * 120 days/season)

Cost-Effectiveness

Paragraphs (d)(6) and (d)(8)

250	commercial traditional, uncontrolled fireplaces (estimate)
3,600	incremental cost to install EPA Phase II-certified unit (Houck, 2006a)
3,200	incremental cost to install dedicated NG unit (Houck, 2006a)
450,000	capital costs for US EPA Phase II-certified wood burning device
400,000	capital costs for natural gas
850,000	Total capital costs
0	O&M costs presumed to be equivalent to existing non-compliant technology
12.50	present value factor (5% interest rate)
1.6	annual emission reductions

$$\frac{K + (O\&M \times [PVF])}{\text{Emission Reductions} \times 20 \text{ years}} = \frac{850{,}000 + 0}{31}$$

$$= \frac{850{,}000 \text{ \$ annual costs}}{31 \text{ 20 years of ER}}$$

CE for avg wood usage = 27,008 $ per ton PM reduced

CE for high-range wood usage = 14,167 $ per ton PM reduced

Emissions Reductions

Paragraph (d)(9)

0.95	avg cords per wood heater (Houck, 2006)
1,400	avg kgs per cord (Houck, 2006)
1,330	avg kgs of wood burned per wood heater
27,414	number of non-cert. wood heaters in Riv/SB (Houck, 2006)
0.1	percentage of annual property transfers (SJVUAPCD, 2004)
2,741	annual property transfers
0.7	percent. replacing non-certified with certified wood htrs (est.)
0.2	percentage replaced with dedicated NG unit (estimate)
0.1	percentage removed/rendered inoperative (estimate)
1,919	HHs installing EPA-Phase II certified
548	HHs installing dedicated NG unit
274	HHs removing wood heaters or rendering inoperable
6.29	reductions (grams/kg) from installing EPA Phase II-certified
12	reductions (grams/kg) from installing dedicated NG unit
13	reductions (grams/kg) from removing/rendering inoperative
16,054	annual reductions (kgs) replacing non-EPA certified wood htrs
8,751	annual reductions (kgs) from installing dedicated NG unit
4,740	annual reductions (kgs) from removing/rendering inoperative
29,544	Total kgs of PM reduction
32	Annual tons PM reduced from property transfer
0.92	Discount factor for wood heaters not used
30	Total tons PM reduction per year beginning in 2013

Cost-Effectiveness

Paragraph (d)(9)

1,919	HHs installing EPA-Phase II certified
548	HH installing dedicated NG unit
274	HHs removing wood heaters or rendering inoperable
3,600	incremental cost to install EPA Phase II-certified unit (Houck, 2006a)
3,200	incremental cost to install dedicated NG unit (Houck, 2006a)
500	cost to remove/render inoperative
6,908,328	capital costs for US EPA Phase II-certified wood burning device
1,754,496	capital costs for dedicated NG unit
137,070	capital costs to remove/render inoperative
8,799,894	Total capital costs
0	O&M costs presumed to be equivalent to existing non-compliant technology
12.50	present value factor (5% interest rate)
30	annual emission reductions

$$\frac{K + (O\&M \times [PVF])}{\text{Emission Reductions} \times 20 \text{ years}} = \frac{8{,}799{,}894 + 0}{598}$$

$$= \frac{8{,}799{,}894 \text{ \$ annual costs}}{598 \text{ 20 years of ER}}$$

Cost effectiveness = 14,716 $ per ton PM reduced